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EXTENDED REDUCTIONS IN STEREOTYPIC BEHAVIOR OF STUDENTS WITH AUTISM THROUGH A SELF-MANAGEMENT TREATMENT PACKAGE

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The literature suggests that self-management treatment packages have two potential strengths for the reduction or elimination of stereotypic behavior: (a) Self-management may be used for extended periods of time in the absence of a treatment provider, and (b) self-management techniques are easily adapated and used in a wide variety of natural settings. We assessed whether students with severe autistic disabilities could learn to use a self-management treatment package to reduce their stereotypic behavior within a multiple baseline across subjects design with withdrawals. The results showed that all of the students learned to use self-management procedures to reduce greatly levels of stereotypic behavior (typically to zero), and improvement occurred for extended periods of time in new settings without the presence of a treatment provider. The results are discussed in terms of the practical value of the treatment package and in terms of the implications for understanding autism.

DESCRIPTORS: self-management, stereotyped behavior, generalization, maintenance, autistic behavior

For individuals with severe disabilities, a wide variety of treatment techniques have been proposed to decrease stereotypic behaviors, including shock (Baumeister & Forehand, 1972), overcorrection (Foxx & Azrin, 1973), physical exercise (Kern, Koegel, & Dunlap, 1984), time-out (Sachs, 1973), delayed reinforcement (Dunlap, Koegel, Johnson, & O'Neill, 1987), and differential reinforcement of other behavior (DRO) (Harris & Wolchik, 1979). Self-management is a relatively new treatment technique that holds great promise for facilitating widespread behavioral change. Thus far self-management has been used successfully to reduce the aberrant and stigmatizing behavior of people with mild to moderate mental retardation (Dunlap, Dunlap, Koegel, & Koegel, in press; Gardner, Cole, Berry, & Nowinski, 1983; Grace, Cowart, & Matson, 1988; Zegiob, Klukas, & Junginger, 1978).

Although recent literature suggests that people with severe disabilities may be capable of learning self-management techniques (Koegel & Koegel, 1989), it remains an empirical question whether people with severe disabilities can learn to use self-management to decrease their stereotypic behavior. As a treatment for the reduction of stereotypic behavior, self-management has the following potential strengths: (a) Self-management may be used for extended periods of time in the absence of a treatment provider, and (b) self-management techniques may be easily adapted and employed in a wide variety of natural settings. The purpose of this investigation was to determine empirically whether severely handicapped individuals with autism could be taught to use self-management procedures to reduce their stereotypic behavior and, if so, whether the behavior changes could be maintained over extended periods of time in community settings with minimal treatment provider involvement.

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Table 1
Student Characteristics

Student	C.A.	M.A.[a]	Vine-land	Reason for referral
1	9	3-5	69	Mother considering residential placement because of excessive and disruptive ritualistic behavior.
2	14	2-9	58	Conspicuous stereotypic behavior reported to be stigmatizing in public places.
3	11	5-3	41	School recommending expulsion because of loud and conspicuous sterotypic behavior.
4	13	5-11	35	Conspicuous stereotypic behavior reported to be stigmatizing in public places.

[a] Leiter International Performance Scale.

GENERAL PROCEDURES

Subjects

The first 4 autistic children referred to our research center who met the following criteria were selected for participation. Each student exhibited a high level of stereotypic behavior that was reported by parents and teachers as interfering with a community placement, was severely handicapped (i.e., had a nonverbal mental age of less than half their chronological age), and had sufficient language skills to learn to understand simple questions (e.g., "Is this 'hand flapping?'") and the motor skills necessary to make a written check mark or affix a sticker. Descriptions of individual subjects are provided in Table 1, which shows their chronological ages (C.A.), recent mental age (M.A.) scores, and socialization domain scores on the Vineland Adaptive Behavior Scales.

Measurement

Stereotypic behaviors were defined as ritualistic behaviors that did not appear to serve any function other than to provide sensory input. Based on behavioral observations and parent and teacher reports, lists were compiled of each student's stereotypic behaviors (see Table 2). These lists were given to the observers for purposes of data recording.

Data were recorded in 10-min probes using continuous 1-min interval recording. Baseline probes were recorded over a minimum of 2 days per child (range, 2 to 5 days), with a minimum of one (range, one to four) probe in every session. Contiguous probes were recorded within treatment sessions so that the progression of change could be seen every 10 min. During all conditions, at the end of each minute a plus (+) was recorded if any of the targeted (stereotypic) behavior was observed, and a minus (−) was recorded if none of the targeted behavior was observed. The accuracy of self-recording was indicated by circling responses (pluses and minuses) that were self-recorded inaccurately.

Reliability

Reliability measurements were taken during all phases of Experiments 1 and 2. During 45 sessions, a second observer independently recorded occurrences and nonoccurrences of stereotypic behavior. Observers were the authors and six speech and hearing science undergraduates who were trained in the data recording method. An agreement was scored for an interval when both observers recorded a plus (+) or when both recorded a minus (−). Reliability was calculated separately for occurrences and nonoccurrences using 1-min interval-by-interval comparisons and dividing the number of agreements by the number of agreements plus disagreements. The reliability scores for occurrences averaged 81% agreement across sessions with a range of 63% to 93%. The reliability scores for nonoccurrences averaged 93% agreement across sessions with a range of 88% to 100%.

EXPERIMENT 1: USE OF SELF-MANAGEMENT PROCEDURES IN A TREATMENT SETTING

METHOD

Settings, Design, and Procedures

Students 1, 2, and 4 received training in a speech and language treatment room while engaged in a variety of academic and self-help tasks (e.g., matching, vocabulary learning, prereading, premath, cooking). Student 3 received training in various community settings (e.g., grocery stores, restaurants) while engaged in independent living tasks such as buying groceries, ordering food, and requesting help. Sessions typically lasted about 1 hr and took place twice weekly for each student (excluding illnesses or vacations). A multiple baseline across subjects design was used for all 4 students, with the addition of a withdrawal condition for 1 student.

Baseline

During baseline sessions, procedures designed to decrease stereotypic behavior that were already in use by the students' parents or teachers were not modified and consisted solely of reactive measures for inappropriate behavior (i.e., instructions to stop engaging in the stereotypic behavior and/or verbal redirection to the task) delivered on an intermittent schedule.

Self-Management Training

Pretraining preparations. For each student, stereotypic behaviors reported by parents and teachers to be problematic were targeted; these behaviors were labeled using a response class with which the student was familiar (e.g., Student 3's stereotypic behaviors were grouped and labeled as "singing"). Based on school and home observations, a variety of functional reinforcers were identified (reinforcers for Students 2 and 4 consisted of a variety of edible rewards, whereas reinforcers for Students 1 and 3 consisted of small toys and musical tapes, respectively). An initial self-management interval was chosen by determining the average length of intervals during baseline that did not contain stereotypic behavior (this varied from 15 s for Student 4 to 30 s for Student 3).

Table 2
Stereotypic Behaviors for Each Student

Student 1
1. Repetitive arm flapping.
2. Repetitive jumping.
3. Tearing or crumpling papers and/or mutilating objects.
4. Ritualistic pushing, hitting, kicking objects or people.
5. Fleeing or avoiding home to engage in ritualistic behaviors (e.g., staring at people, repetitively asking noncontextual questions of neighbors, etc.).
6. Rhythmic finger tapping.

Student 2
1. Repetitive saliva fingering.
2. Continuous thumb sucking.
3. Repetitive touching of lips and tongue.
4. Repetitive biting of fingernails and cuticles.

Student 3
1. Loud humming with hands placed over ears.
2. Loud, repetitive "instrumental" vocalizations sometimes accompanied with hand fingerings near mouth representative of playing the trumpet.
3. Singing verbalizations that would appropriately be spoken.

Student 4
1. Intense staring (a fixed, glassy-eyed look lasting more than 3 s).
2. Repetitive nonsense syllable vocalizations.
3. Repetitive knee shaking (small rapid movements from side to side).
4. Repetitive finger flexing and arm waving at shoulder level.
5. Prolonged and/or repetitive lip puckering.
6. Intense and inappropriate exaggerated smile lasting more than 3 s (these typically lasted approximately 2 to 15 min, during which the student did not respond appropriately).

Discrimination training. Students were briefly (over a period of a few minutes for Students 1, 2, and 3, and approximately 1 hr for Student 4) taught to discriminate their stereotypic and appropriate behaviors to a criterion of 80% correct identifications in 10 random trials. That is, the treatment provider modeled appropriate behaviors related to the child's tasks as well as each student's stereotypic behaviors, and labeled them using the terms already familiar to each subject (e.g., appropriate behavior response classes were labeled "not singing" or "behaving"; stereotypic response classes were labeled "stim" or "disruptive behavior"). The student was then asked to identify random presen-

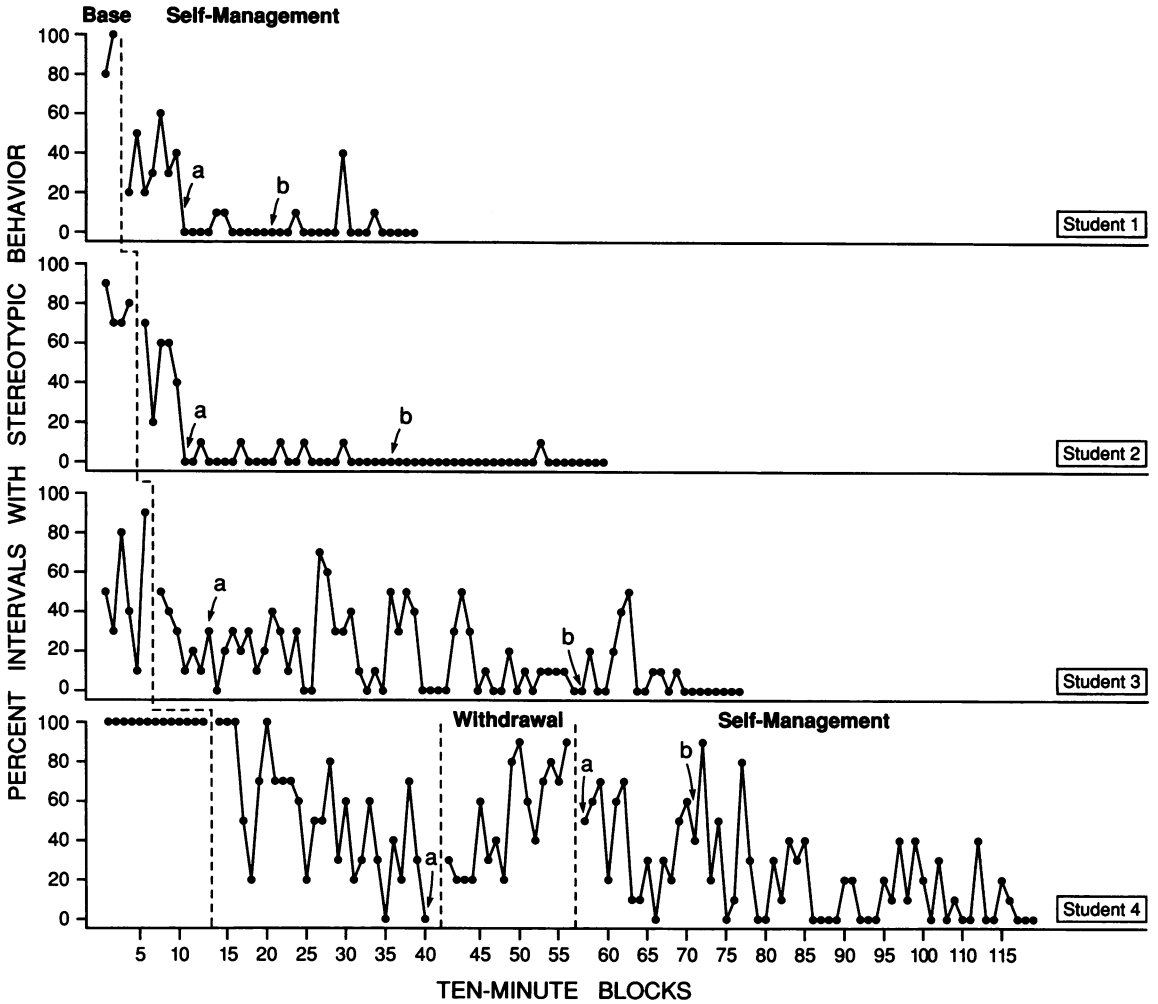

Figure 1. The percentage of 1-min intervals that contained stereotypic behavior during the baseline and self-management conditions. The "a" and "b" on each figure denote the times at which partial prompting and no prompting, respectively, were begun.

tations of appropriate and stereotypic behaviors when modeled by the treatment provider. Students were reinforced for accurate discriminations on a continuous reinforcement schedule with social reinforcers and intermittent edible reinforcers for Students 2 and 4.

Self-management implementation. Following discrimination training, students were taught to place a mark (which could be exchanged for a reinforcer) in a printed box on a piece of paper after intervals of time without stereotypic behavior. For example, Student 3 was asked, "Show me 'no singing.' Ready? Go!" This started the initial time interval (which was cued by the chronograph alarm on a watch). Initially, each time the alarm sounded, students were prompted to conduct self-management activities. For example, the treatment provider might say. "It's time! Did you do any [stereotypic behavior label]?" Following an interval in which no stereotypic behavior occurred, the student was verbally and, if necessary, physically prompted to make a check mark (Students 1, 3, and 4) or affix a sticker (Student 2) in a large box drawn on a card, and then was verbally reinforced. Accurate recording of stereotypic behavior (i.e., not making a check mark in the box) also was verbally rein-

forced (e.g., "That's right, you flapped your arms [demonstrating]. Let's try again.").

Training self-management independence. During the procedures to implement self-management, treatment provider contact was kept to a minimum, and prompts were faded in two steps (see Figure 1). First, prompts were delivered intermittently (i.e., only when the student failed to record his behavior accurately or failed to request a reinforcer when the checked boxes were filled). Second, no prompts of any kind were given. The schedule of reinforcement was gradually thinned by increasing the number of boxes per self-recording card and by gradually lengthening the alarm interval to a period of 15 to 20 min. As a result of these procedures, by the point labeled "b" in Figure 1 the students were typically independently engaging in all of the above self-management procedures without any prompts and were requesting a reinforcer from the treatment provider after several checked boxes (e.g., after intervals of at least 1 hr without any treatment provider contact).

Treatment Withdrawal

In order to evaluate better the effects of the treatment package, self-management procedures were withdrawn for a short time for Student 4. During this phase, the treatment provider remained present, but the self-management watch and cards were not available.

Results and Discussion

Figure 1 shows that, during baseline, students exhibited high levels of stereotypic behavior on all days, with the final percentages ranging from 80% to 100%. With the initiation of self-management procedures, rapid and substantial decreases in stereotypic behavior occurred, often to 0% for Students 1 and 2. For Students 3 and 4, percentages of intervals of stereotypic behavior were more variable, but also frequently reached 0% after the initiation of self-management. The withdrawal of self-management procedures for Student 4 resulted in increasing percentages of stereotypic behavior. Reinstatement of self-management procedures again resulted in variable, but decreasing, percentages of intervals of stereotypic behavior, with increasingly frequent levels at 0%.

The accuracy of students' self-recording was calculated separately for occurrences and nonoccurrences for Students 1, 3, and 4 during each session by dividing the total number of unprompted accurate responses by the sum of the accurate and inaccurate responses. The students' accuracy of self-recording occurrences of the target behavior averaged 39% and varied from 18% for Student 3 to 72% for Student 4. Accuracy of self-recording nonoccurrences of the target behavior averaged 93% across all students and sessions and varied from 90% for Student 4 to 98% for Student 3. All students showed a gradual improvement in their accurate self-recording of nonoccurrences, whereas self-recording accuracy for occurrences remained relatively stable throughout the course of the experiment. These results suggest that, if accuracy was a variable at all, it was the students' recording of the absence of stereotypic behavior that produced behavior change.

EXPERIMENT 2: EXTENSION OF SELF-MANAGEMENT TO ADDITIONAL COMMUNITY SETTINGS

To assess the occurrence of stereotypic behavior following successful reductions in the clinic setting, probes were taken in nontreated community settings. If stereotypic behavior was observed, self-management techniques were implemented. Finally, to assess the maintenance of treatment gains over time and in the absence of trained treatment providers, the treatment provider was removed from the setting.

Method

Subjects, Settings, Design, and Procedures

Students 1 and 3 of Experiment 1 were chosen to participate in Experiment 2 because they were consistently available for prolonged observation and intervention in community settings. Stereotypic behavior was assessed in the natural environment, which was in jeopardy of being changed to a more restrictive environment (the home for Student 1

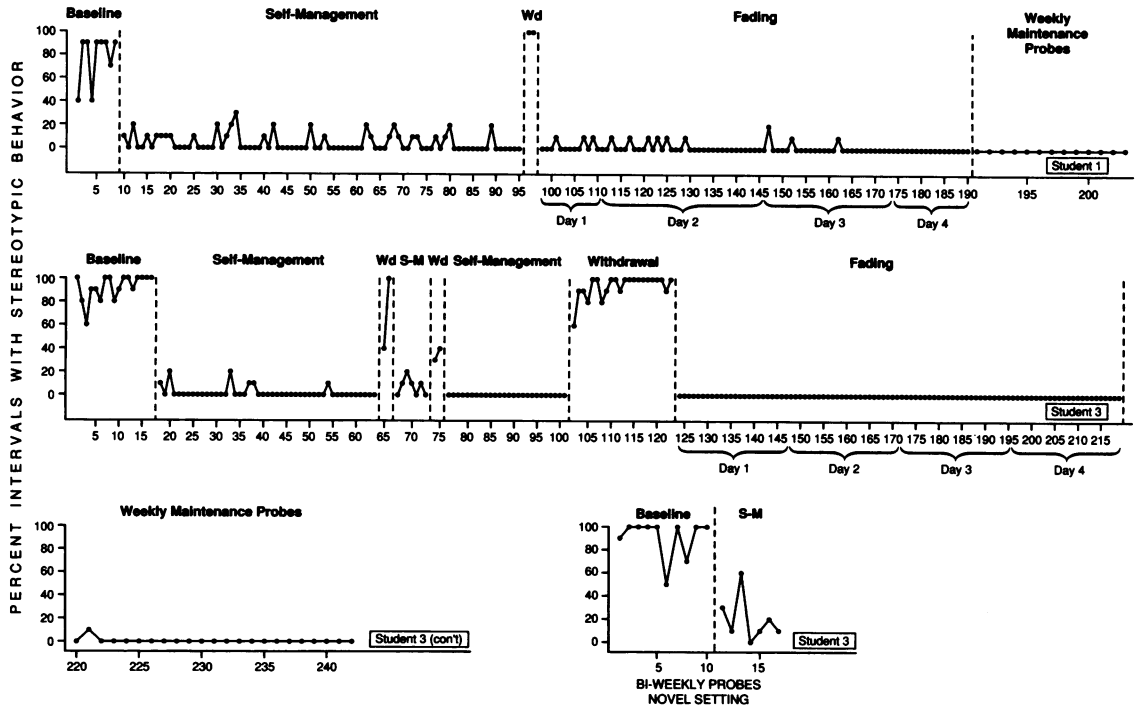

Figure 2. The percentage of 1-min intervals that contained stereotypic behavior during the baseline and self-management conditions in novel settings. The fading condition and subsequent maintenance probes (plotted weekly) show the child's behavior in the absence of a treatment provider. The park setting for Student 3 represents the setting that was never associated with the treatment provider.

and the classroom for Student 3). An additional novel setting (a park) was used for Student 3. A multiple baseline across subjects design was used, with repeated withdrawal conditions for both students.

Baseline probes. Baseline probes were collected in the same manner as in Experiment 1. Except for the park setting, the treatment provider was present but did not interact with the students. The treatment provider never entered the park setting during this experiment. During all baseline probes, the students did not wear the self-management watch and did not carry the self-recording cards.

Self-management implementation. If stereotypic behavior was exhibited, self-management was implemented in the relevant setting by presenting students with the watch and cards and telling them to use the materials. No other prompts were provided at any time during Experiment 2. In the park setting, the self-management watch and cards remained with the student when he left the classroom to go to the park. No additional instructions were given.

Treatment withdrawals and fading of the treatment provider. Self-management procedures were withdrawn by not presenting the watch or cards during withdrawal conditions. Students self-managed their behavior during fading conditions in the absence of a treatment provider for increasingly longer periods as the treatment provider stepped out of the room and then returned after gradually longer periods. Because the purpose of this phase of the experiment was to determine whether self-management could be implemented for prolonged periods, the relevant data were the students' behavior *in the absence of the treatment provider.* The fading phase required approximately 24 hr, distributed over 4 days for both students. During the initial stage, the treatment provider alternately was present in the training setting for

approximately 5 min, then left the room for approximately 5 min, and then returned to make a validation check. During validation checks, the treatment provider asked the student's teacher or parent whether they had observed the student exhibiting stereotypic behavior in the treatment provider's absence. Then the treatment provider met with the student to review the student's self-recording check sheet to compare it with the validation report. If the student had appropriately self-recorded the absence of stereotypic behavior while the treatment provider was gone, he was praised enthusiastically and told to "keep up the good work." When the student's teacher or parent indicated that the student had inappropriately used the materials in the treatment provider's absence (e.g., not wearing the watch or marking down strings of check marks while engaging in stereotypic behavior), any check marks the student had given himself during that validation period were erased.

After validation checks indicated that self-management occurred without prompts in the treatment provider's absence, the treatment provider decreased the number of validation checks to three times the next day, two times the next, and so on, until only one 5-min visit occurred each week. During this visit, student check sheets were collected and reinforcers were delivered.

Maintenance. Validation checks were continued throughout this phase, and maintenance probe data were collected weekly by the data recorders. The student's teachers and/or parents corresponded daily with the treatment provider by telephone or by briefly jotting in a notebook whether they had observed the student appropriately giving himself checks. Inappropriate recording of checks was never observed for Student 1 and was rarely observed for Student 3 (approximately 3 occurrences during the first week of self-management, and none thereafter). "Forgetting" to record intervals without stereotypic behavior was never reported for either student.

Results and Discussion

Figure 2 shows that, during baseline, stable or increasing stereotypic behavior occurred up to levels of 100% for Student 3 and 90% for Student 1. Self-management procedures resulted in immediate and dramatic reductions in stereotypic behavior. When self-management procedures were withdrawn, rapid increases in the percentages of stereotypic behavior to baseline levels resulted. The percentages of stereotypic behavior then immediately decreased with the reinstatement of self-management procedures. Fading and maintenance probes showed that reduction in stereotypic behavior through self-management could be maintained in the treatment provider's absence. Similarly, data collected in a setting completely unassociated with the treatment provider (a park) showed high levels of stereotypic behavior before the self-management cards and watch were given to the student. However, once the student began using the self-management materials in the park setting, stereotypic behavior immediately decreased.

In summary, the results of these analyses show that reductions in stereotypic behavior did not occur spontaneously across settings; however, self-management occurred very rapidly in community settings. Reductions in stereotypic behavior in various community settings and in the treatment provider's absence were then maintained over time.

GENERAL DISCUSSION

The results of this experiment suggest that the self-management treatment package provided an effective and efficient method of obtaining treatment gains across settings with minimal treatment provider involvement and with maximal student involvement. Thus, it is not only practical for service providers, but it helps to eliminate the passivity problem that is so pervasive among students with autism (cf. Koegel, Koegel, & O'Neill, 1989).

It is interesting to note that students usually recorded the absence of stereotypic behavior accurately but rarely noted the presence of stereotypic behavior accurately. Thus, the exact causal relationship of self-management to behavior change remains a matter for speculation. There are many possible explanations for students' self-recording inaccuracy concurring with behavior change. First,

reinforcers for self-management may have been presented inadvertently on a DRO schedule for appropriate behavior rather than for self-management. A second common explanation for behavior change occurring when self-recording is inaccurate is simply that the accuracy and the reactivity of self-recording are independent (Broden, Hall, & Mitts, 1971; Rooney, Hallahan, & Lloyd, 1984). Finally, it is possible that, when stereotypic behavior occurs, it interferes with the students' ability to identify their own behavior accurately and that it was entirely the recording of the *absence* of stereotypic behavior that was responsible for the behavior change.

It is important to note that this investigation describes a self-management treatment package specifically developed for students with severe disabilities. We applied a package with several components (e.g., self-management and the availability of reinforcers) without any analysis of the separate influence of package components. Self-management treatment technology for people with severe handicaps is still in its infancy and is not a substitute for good teaching. For example, functional analyses to assess the reasons for stereotypic behavior should be conducted, and appropriate behaviors to replace inappropriate behaviors should be taught (Carr, 1988; Carr & Durand, 1985; O'Neill, Horner, Albin, Storey, & Sprague, 1989). This experiment does, however, suggest that self-management procedures should not be discounted as being too cognitive for use with people having severe disabilities.

Past research suggests that reducing stereotypic behavior in enriched environments results in collateral gains in social, communication, and academic skills (see Koegel & Koegel, 1989). Further research is needed to measure the concurrence of self-management with collateral behavior gains such as increased frequency of interactions with the environment and decreases in disruptive behaviors not specifically targeted. In addition, it would be interesting to measure staff and parent attitude and frequency of interactions with the child both before and after self-management training. Because self-management skills are inherent to society's view of "normalcy," refining techniques for teaching self-management skills to people with severe disabilities is an area of considerable promise and practical value.

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